

January 2002

Proposed Plan for Operable Unit 10-04

Waste Area Groups 6 and 10



U.S. Department of Energy
U.S. Environmental Protection Agency
Idaho Department of Environmental Quality

Idaho National Engineering and Environmental Laboratory

Public Comment Period

January 28 – February 27, 2002

How You Can Participate:



Read this proposed plan and review related documents in the INEEL Administrative Record.

Call the INEEL, State of Idaho, EPA, or DOE project managers for more information or to schedule a briefing.

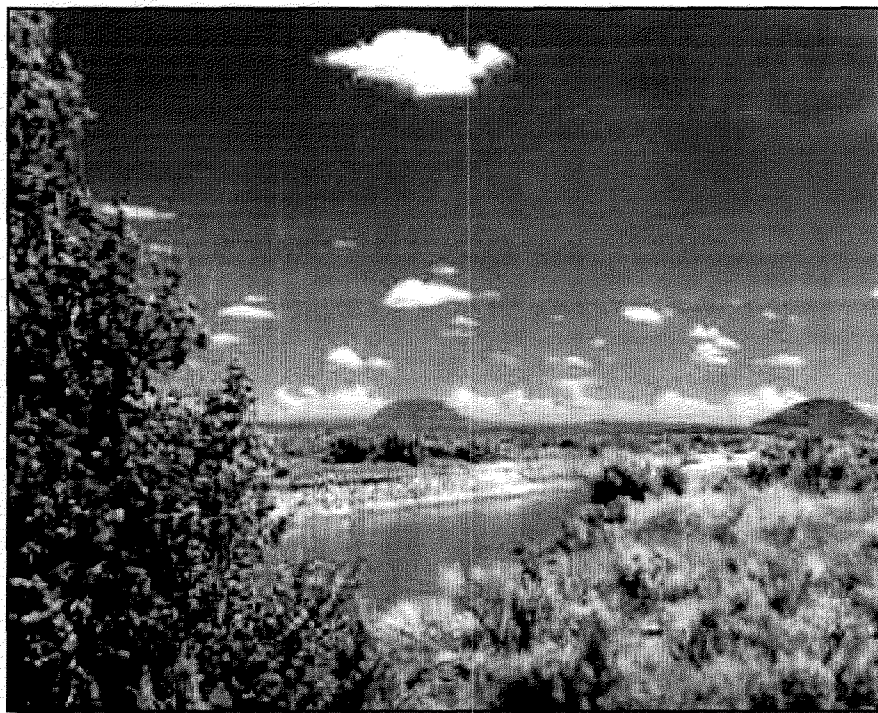


Attend a public meeting to hear more, ask questions, and tell us what you think.

Comment on this proposed plan by using the postage-paid comment form on the back cover.



See page 37 for more information.



INTRODUCTION

The Idaho National Engineering and Environmental Laboratory (INEEL), a U.S. Department of Energy (DOE) facility in southeastern Idaho, has completed the investigation of Operable Unit (OU) 10-04. OU 10-04 includes Waste Area Group (WAG) 6—the former Boiling Water Reactor Experiment (BORAX) and Experimental Breeder Reactor I (EBR-I) facilities—as well as surface contamination sites in WAG 10. WAG 10 comprises all the areas of the INEEL that are outside the nine major facilities (WAGs 1 through 9) (see Figure 1 on page 2). In all, a total of 50 sites were investigated.

Two broader investigations were also part of OU 10-04. First, the Shoshone-Bannock Tribes (the Tribes) of the Fort Hall Indian Reservation, whose members traditionally occupied the INEEL area and continue to use parts of it for many cultural and economic purposes, contributed a summary of what is important to them in defining and remediating risks to human health and the environment. Second, OU 10-04 also investigated the risks to ecological receptors across the INEEL from all contaminated areas combined. This INEEL-wide ecological risk assessment was the culmination of all site-specific ecological risk assessments carried out at the INEEL.

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Note: When technical or administrative terms are first used, they are printed in **bold italics** and explained in the margin. Referenced documents are listed at the end of this proposed plan. Footnotes provide additional information.

info For ease of reading, abbreviated names were used for several ordnance sites in this proposed plan. These, and the official names they refer to, are:

- Field Station (Experimental Field Station)
- Fire Station (Fire Station II Zone and Range Fire Burn Area)
- Land Mine Disposal Area (Land Mine and Fuze Burn Area)
- NOAA Grid (National Oceanic and Atmospheric Administration Grid)
- NODA (Naval Ordnance Disposal Area)
- Gun Range (Security Training Facility Gun Range).

unexploded ordnance (UXO)

Military munitions that have been primed, armed, or fused, and fired, dropped, or launched, but which have failed to explode through malfunction or design. Unexploded ordnance poses a physical risk to human safety through the danger of explosion when it is handled or contacted, especially by machinery.

TNT (2,4,6-trinitrotoluene)

The most common explosive used in military ammunition. TNT is very persistent in soils and is known to cause skin irritation, nervous system damage, anemia, and liver dysfunction in animals and humans who contact it, ingest it, or inhale its dust.

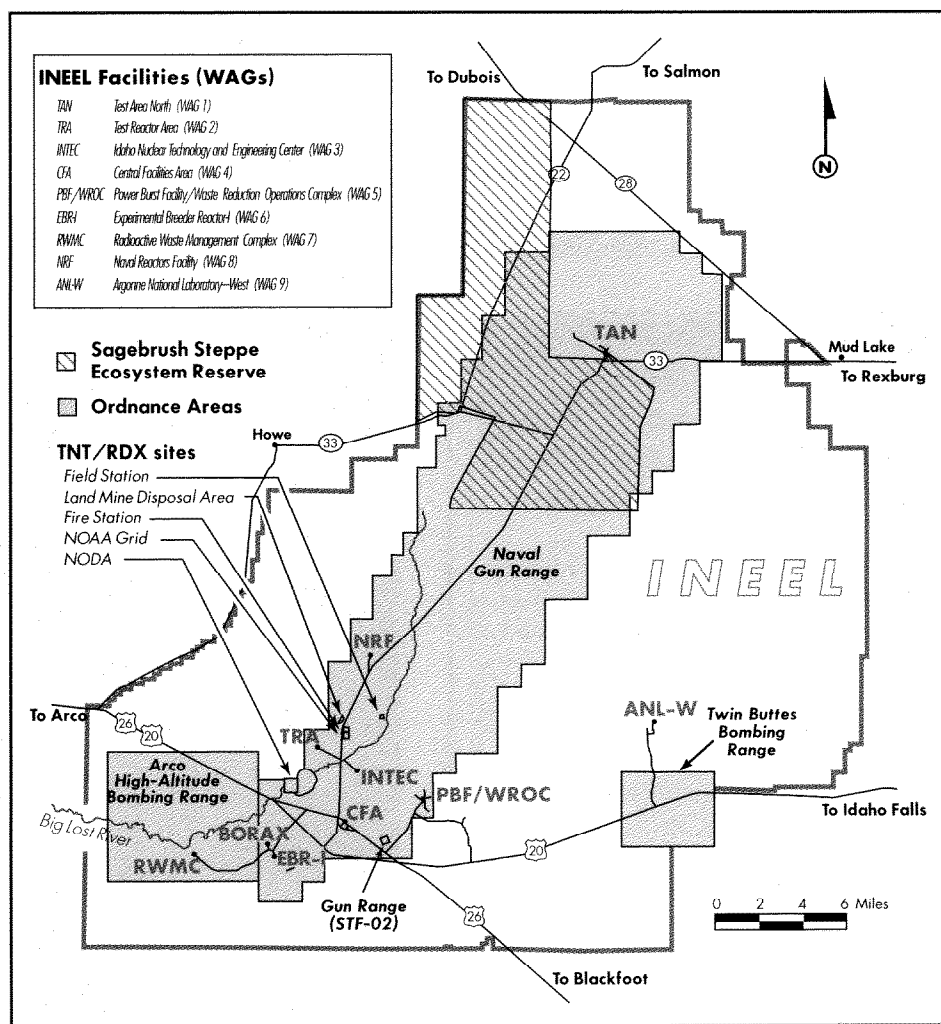


Figure 1. Location of contaminated soil sites in OU 10-04 (WAGs 6 and 10).

The OU 10-04 investigation determined that at nine sites, contamination of the ground surface poses risks to human health and the environment that must be remediated. Eight of these sites became contaminated during and after World War II when the U.S. Navy and the U.S. Army Air Corps used part of what is now the INEEL for ordnance testing, demolition of explosives, and bombing practice (see Figure 1 above).¹ These eight sites have been separated into two groups. The first group consists of three large ordnance areas; the Naval Gun Range, the Arco High-Altitude Bombing Range, and the Twin Buttes Bombing Range (here after referred to as the Ordnance Areas). These areas must be remediated to mitigate risk to human health from **unexploded ordnance (UXO)**. In addition to the larger areas, five sites inside the area of the Naval Gun Range have a high probability for potential UXO; these include Railcar Explosion Area, NODA, Mass Detonation Area, Field Station, and Land Mine Disposal Area (see Figure 2 on page 15).² The second group of sites are contaminated with chemical compounds (principally **TNT**) from old explosives tests. These five sites known as the Field Station, Fire Station, Land Mine Disposal Area, NOAA Grid, and NODA are also located within the Naval Gun Range. The ninth site, the Gun Range used for security training by

INEEL personnel, has unacceptable levels of lead contamination from spent bullets.

This proposed plan summarizes the results of the comprehensive *remedial investigation and feasibility study (RI/FS)*³ that investigated these sites. It describes the contamination that requires cleanup, and presents the alternatives developed to address these risks. For each site that requires cleanup, a preferred alternative is identified and the reasons for the preference are explained. The public is asked to read this plan and respond with any comments and preferences during the public comment period, January 28 through February 27, 2002. The Agencies will select the remedial alternatives to be used after they review and consider all information submitted during the 30-day public comment period for this proposed plan. The Agencies may modify the cleanup remedy based on new information or public comments. Page 37 of this plan lists several ways that members of the public can respond with comments in writing, by e-mail, or in person. The last page of this plan is a postage-paid comment form.

Three government agencies are responsible for cleanup activities at the INEEL. The U.S. Department of Energy (DOE) is the lead agency for INEEL activities. The U.S. Environmental Protection Agency (EPA) and the State of Idaho Department of Environmental Quality (IDEQ) are designated as the support agencies. Together, the three are referred to as the Agencies.

The Agencies identified and concurred with the preferred cleanup alternatives presented in this proposed plan. The INEEL *Administrative Record* contains the comprehensive RI/FS, which this plan summarizes, and other relevant documents used by the Agencies to reach these recommendations. The Agencies will consider community acceptance of the alternatives, as indicated by the comments received, before they select the final cleanup remedies. The public's comments and the Agencies' responses will be published in the Responsiveness Summary section of the *Record of Decision*, which is scheduled for completion on or before September 2002.

The OU 10-04 study did not include an investigation of groundwater contamination of the Snake River Plain Aquifer. This is because the aquifer contamination study required information from several investigations that are still under way (including the remedial investigation of the Radioactive Waste Management Complex, and investigation of groundwater contamination from the Tank Farm soils and Injection Well at the Idaho Nuclear Technology and Engineering Center [INTEC]). The Agencies agreed to carry out the aquifer investigation separately, allowing the rest of the WAG 6 and 10 studies to be completed on schedule and presented in this plan.⁵ A separate study, designated OU 10-08, is currently addressing regional Snake River Plain Aquifer concerns related to the INEEL.

At 41 sites in WAGs 6 and 10, the remedial investigation showed that no contamination exists, that the concentrations of contaminants are too low to pose risks, that there is no exposure pathway from the contamination to human or ecological receptors, or that the contamination had been remediated in previous actions. A summary of this information is included on page 34. The study showed that no WAG 6 sites pose threats to human health or the environment that require cleanup. Nine sites in WAG 10 must be cleaned up to remediate threats to human health.

remedial investigation/feasibility study (RI/FS)

A study that identifies which contaminants are present in an area, assesses the risk they pose to human health and the environment, and evaluates remedial options. A comprehensive RI/FS addresses all known areas of contamination within one or more Waste Area Groups.



The Agencies are issuing this proposed plan as part of their public participation responsibilities under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Administrative Record

The collection of information, including reports, public comments, and correspondence, used by the Agencies to select a cleanup action. A list of locations where the INEEL Administrative Record is available appears on page 35.

Record of Decision (ROD)

A public document that explains which remedies will be used at a site and why. The Responsiveness Summary contains the public comments received on the proposed actions and the Agencies' responses.



The Eastern Snake River Plain Aquifer, one of the largest in the U.S., was classified as a sole-source aquifer by the EPA in 1991.⁴ A sole-source aquifer supplies at least 50% of the drinking water consumed in the area overlying the aquifer. About 9% of the Eastern Snake River Plain Aquifer lies beneath the INEEL.



The INEEL is expected to remain under government management and control for at least the next 100 years. This is referred to as the institutional control period. After this time, the federal government is obligated to continue to manage and control areas that pose a significant health and/or safety risk to the public and workers until risk diminishes to an acceptable level.

National Priorities List

The formal list of the nation's hazardous waste sites that have been identified for possible remediation (cleanup). Sites are included on the list because of their potential risk to human health and the environment.⁷

Federal Facility Agreement and Consent Order (FFA/CO)

An agreement among the DOE, the EPA, and the State of Idaho to evaluate potentially contaminated sites at the INEEL, determine if remediation is warranted, and select and perform remediation, if necessary.⁸

SITE HISTORY

The INEEL is an 890-square-mile DOE facility located on the eastern Snake River Plain, a relatively flat, semi-arid desert in southeastern Idaho. The INEEL contains some of the last remaining sagebrush steppe ecosystem in North America. It has been protected as a National Environmental Research Park since 1975. In 1999, 116 square miles (74,000 acres) in the northwest part of the INEEL were set aside as a Sagebrush Steppe Ecosystem Reserve for environmental research.

The INEEL lies within the lands traditionally occupied by the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation. The Tribes have used the land and waters within and surrounding the INEEL for fishing, hunting, and plant gathering. Resources available on the INEEL fulfill medicinal, religious, ceremonial, educational and other cultural purposes. Under the Agreement-in-Principle⁶ between the Tribes and the DOE, some tribal activities continue today within the INEEL boundaries.

U.S. government use of the INEEL area began during the 1940s, when the U.S. Navy established the Naval Gun Range to carry out naval artillery testing and other wartime preparations. The U.S. Army Air Corps used other areas for bombing practice. In 1949, the U.S. Atomic Energy Commission established the Nuclear Reactor Testing Station at the INEEL. Subsequent name changes to Idaho National Engineering Laboratory (INEL) and INEEL have reflected the addition of new missions.

In the 1980s, the INEEL began investigation and cleanup of remaining environmental contamination left from these decades of government use. The INEEL was placed on the *National Priorities List* of hazardous waste sites in 1989. In 1991, the Agencies signed a *Federal Facility Agreement and Consent Order (FFA/CO)* outlining the restoration process and schedule for the INEEL. To assist the cleanup organization and scheduling, the INEEL was divided into 10 waste area groups. Nine groups (WAGs 1 through 9) were defined to correspond to the major INEEL facilities. WAG 10 was defined to incorporate contamination sites like the ordnance testing areas that encompass several facilities or lie outside them (see Figure 1 on page 2).

WAG 6 consists of sites related to EBR-I and BORAX (see Figure 1 on page 2). EBR-I was the first reactor built on the INEEL, and achieved fame in 1951 as the first reactor in the world to generate usable amounts of electricity from nuclear power. Of the many buildings that once made up the EBR-I complex, only the original reactor building (now a national historic landmark) and associated structures remain.

The BORAX facility included five experimental reactors built between 1953 and 1964 for research in generating electricity using boiling-water reactors. On July 17, 1955, BORAX-III made world history as the first nuclear reactor to power a town, when it supplied electricity to Arco, Idaho. The BORAX-I reactor was intentionally destroyed in 1954 during research on reactor safety, and its burial location underwent final remediation in 1996.⁹ Decontamination and dismantlement have also remediated and removed all other facilities at the BORAX area.

Although WAG 10 was explicitly defined as excluding major facilities, it does contain various utilities, such as power lines, as well as small operations

structures and areas, such as entrance and exit guard gates and training areas. Most of the 890 square miles (excluding major facilities) in WAG 10 are undeveloped.

Remedial actions have been completed at all WAG 6 sites requiring cleanup. The OU 10-04 remedial investigation reviewed these actions as part of its scope and determined that no additional cleanup is required at any WAG 6 sites.

The OU 10-04 remedial investigation determined that nine sites in WAG 10 have contamination that requires cleanup. Five sites have soils contaminated with chemicals from explosives, such as TNT. One site is a gun range where INEEL security training has left lead contamination in soil from spent bullets. Three are World War II-era artillery testing and bombing ranges in which potential unexploded ordnance remains a hazard. Previous WAG 10 ordnance removals include the OU 10-05 Ordnance Interim Action in 1993 and several OU 10-03 Removal Actions between 1994 and 1997.¹⁰

SCOPE AND ROLE OF THE ACTION

This cleanup action is part of the environmental restoration of the INEEL. Under the terms of the FFA/CO, DOE will carry out the cleanup and pay for all costs associated with it.

This proposed plan presents the results of a comprehensive RI/FS detailed in the Comprehensive Remedial Investigation/Feasibility Study for Waste Area Groups 6 and 10 Operable Unit 10-04 at the Idaho National Engineering and Environmental Laboratory (the RI/FS).

Within the INEEL's environmental restoration program, this action is identified as OU 10-04. This action will control or prevent current and future exposure of workers, the public, and the environment to contaminated soils and unexploded ordnance. This response will permanently reduce the toxicity, mobility, and volume of the contamination at the INEEL.

Following a 5-year cycle, the Agencies will review these remediation activities to monitor their progress and ensure their effectiveness. If the 5-year review process detects other contaminants, or finds that the remedy and/or institutional controls put in place are ineffective, additional measures will be implemented as appropriate. The remedies selected for cleanup of the contaminated sites described in this proposed plan will constitute the final remedial action for these sites.

Although the OU 10-08 will be addressing the site-wide groundwater issues, the groundwater exposure pathway was addressed for sites within OU 10-04. The process used was similar to what was done previously at other WAGs. This includes modeling contaminant movement into groundwater and determining if there would be any significant impacts to groundwater quality.

OU 10-08 will:

- (1) evaluate current and historical site-wide groundwater data generated from the individual WAGs, U.S. Geological Survey (USGS), and other projects if available;
- (2) assume that the records of decision (RODs) and remedial design and remedial action (RD/RA) work plans (WPs) for each WAG will address necessary groundwater remediation from each facility;
- (3) prepare and conduct long-term regional monitoring;
- (4) prepare a qualitative assessment of risk for the Snake River Plain (SRP) aquifer beneath the INEEL.

SITE CHARACTERISTICS

Of the 50 sites investigated in OU 10-04, nine must be remediated to protect human health and the environment. The nine sites have been grouped for assessment and remediation based on their contaminant types.

The three Ordnance Areas are the Naval Gun Range, the Arco High-Altitude Bombing Range, and the Twin Buttes Bombing Range. It is most likely that most or all of the projectiles and bombs used were practice munitions, which are not capable of detonation. However, it is suspected that some UXO might be present within the ranges.

The Naval Gun Range also includes five sites where UXO is likely to remain from past military testing. These five sites are the Railcar Explosion Area, NODA, Mass Detonation Area, Field Station, and Land Mine Disposal Area. Although UXO has previously been detected and cleared from these sites, the extent of potential UXO outside these areas has not been determined, and clearance of ordnance, based on experience, may not be 100% effective.

Unexploded ordnance remaining from military testing in the 1940s poses a rare, but substantial, safety risk to current workers as well as future residential, industrial, and tribal users of these sites. Although some of the ordnance is visible on the ground surface, geophysical investigations for buried munitions are seldom 100% effective. In many cases a munition is buried too deep, is too small to be detected, or is constructed of a material difficult to detect. Additional unexploded ordnance may be buried beneath the surface that could be brought to the surface by frost heaving and erosion, or inadvertently encountered during the use of construction or drilling machinery. Approximately 325 square miles may contain unexploded ordnance.

The five TNT/RDX Contamination Sites are contaminated by chemical compounds remaining from military ordnance testing involving low-order detonations: principally TNT and **RDX**, along with the associated compounds **dinitrotoluene** and **dinitrobenzene**. All of these are explosive compounds common in ammunition. They break down slowly in soil and harm human and animal health primarily through effects on the nervous system. Dinitrotoluene and dinitrobenzene are formed by the breakdown of TNT. Stained soil and chunks of explosives are visible in widely scattered regions within the TNT/RDX Contamination Sites. Contamination at these sites is generally limited to the top 2 feet of the soil. These sites may also contain unexploded ordnance. TNT and RDX in these sites pose a risk to future residents, and a potential risk to groundwater. The total amount of contaminated soil that requires remediation at the TNT/RDX Contamination Sites is approximately 800 yd³.

The Gun Range Site (STF-02) is contaminated with lead from bullets fired during small arms target practice. The lead contamination levels exceed EPA's preliminary remediation goals. Unless remediated, the lead contamination could pose a risk to future residents, primarily through damage to nervous systems (especially in children) as a result of exposure to contaminated soil. More than 64 tons of lead are estimated to be present in six earthen impact berms, the surrounding surface soils, and 70 railroad ties used to support shooting targets and construct a wooden building. The contamination ranges from fine particles to large fragments. An estimated 20,000 yd³ of contaminated soil requires remediation.

RDX (Royal Demolition Explosive)

A common explosive in military ammunition, more powerful than TNT. RDX can cause seizures and cancer in animals and humans who ingest it or inhale its dust. The chemical name for RDX is 1,3,5-trinitro-1,3,5-triazine; it is also called cyclonite.

Dinitrotoluene (2,4-dinitrotoluene, or DNT)

A compound associated with TNT that can cause cancer and damage to the nervous system and reproductive system of animals that ingest it or inhale its dust.

Dinitrobenzene (1,3-dinitrobenzene, or DNB)

A compound associated with TNT that can cause anemia and reproductive system damage in animals through skin contact, ingestion, or inhalation.

Additional details about the individual sites are presented in the Description and Evaluation of Alternatives section of this proposed plan.

SUMMARY OF SITE RISKS

The RI/FS included a **baseline risk assessment** to determine whether **contaminants of concern** identified at WAGs 6 and 10 pose a current or potential threat to human health and the environment if no remedial action is taken.

The risk assessment showed that no WAG 6 site poses a threat to human health or the environment that would require cleanup. The long-range land use envisioned for WAG 6 is for industrial facilities. In addition, EBR-I, a national historic landmark, is a tourist attraction during the summer months.¹¹

For the WAG 10 sites, the baseline risk assessment identified possible health risks for people working at these locations, and for children and adults who might live in these locations in 100 years. Long-range uses of WAG 10 are expected to include limited grazing, industry, Native American traditional activities within selected areas, and limited hunting. Although future residential use is not foreseen as likely, human health risks for a potential future resident were calculated because that is the most conservative scenario. Tables 1 and 2 (on pages 8 and 9) summarize the risk assessment results for these sites. The methodologies used to calculate human health risk are described in Appendix D of the RI/FS. The methodologies used to calculate risk to ecological receptors are described in Appendix F of the RI/FS.

Human Health Risks

Ordnance Areas

The Ordnance Areas are comprised of three extensive artillery and bombing ranges dating from World War II. It is most likely that most or all of the projectiles and bombs were practice munitions, which are not capable of detonation. However, it is suspected that some UXO might be present within the ranges. The Naval Gun Range includes five sites where UXO is likely to remain from past military testing. These five sites are the Railcar Explosion Area, NODA, Mass Detonation Area, Field Station, and Land Mine Disposal Area. Although UXO has previously been detected and cleared from these sites, the extent of potential UXO outside of these areas has not been determined. Any unexploded ordnance that may remain across these areas can pose a physical risk to human safety if an explosion is triggered from handling or contact, especially by machinery. Because the risk is from explosion, rather than chronic exposure to chemicals, numerical calculations of excess cancer risk, hazard index, and hazard quotient are not applicable.¹³ It is the Agencies' current judgment that the preferred alternative for the Ordnance Areas identified in this proposed plan is necessary to protect public health and welfare from physical injury due to inadvertent detonation of any unexploded ordnance that may be present.

baseline risk assessment

The process of estimating the current and future impacts if no action were taken to remediate a site. Risk is assessed for two categories of receptor: human and ecological. Human health risk assessment evaluates the potential adverse health impacts to humans. Ecological risk assessment evaluates the potential adverse effects to populations of plants and animals.

contaminants of concern

Hazardous and radioactive substances that pose a potential risk to human health and the environment.



Landmine "fuzes" (fuses) may be set off by a weight of 10 pounds dropped from a height of 24 inches.¹² Fuses may remain at the Land Mine Fuze Burn Area even after the 1996 and 1997 removal actions. If a land mine fuse were to detonate when encountered by an ecological receptor that could produce this type of impact, such as an elk or antelope, it could cause immediate injury or death. In the unlikely event that this was to occur, the detonation would not have significant and detrimental impact to the receptor population.

Table 1. Human health risk assessment results for WAG 6 and 10 sites that require remediation.^a
(Shading indicates risks that exceed acceptable levels, as defined by the remedial investigation.)

| Sites | Human Health Risk | | | |
|---|--|--------------|--|--------|
| | Occupational Scenario (future) | | Residential Scenario (future) | |
| | Excess Cancer Risk | Hazard Index | Excess Cancer Risk | Hazard |
| TNT/RDX Contamination Sites | | | | |
| Field Station | 6 in 100,000 (6×10^{-5}) | 1 | 9 in 100,000 (9×10^{-5}) | 10 |
| Fire Station | 2 in 100,000 (2×10^{-5}) | <1 | 1 in 10,000 (1×10^{-4}) | 10 |
| Land Mine Disposal Area | 4 in 1,000 (4×10^{-3}) | 70 | 6 in 1,000 (6×10^{-3}) | 700 |
| NOAA Grid | 2 in 10,000 (2×10^{-4}) | 4 | 1 in 1,000 (1×10^{-3}) | 200 |
| NODA | 4 in 100,000 (4×10^{-5}) | <1 | 2 in 100 (2×10^{-2}) | 200 |
| Gun Range (STF-02) | b | b | b | b |
| Ordnance Areas | c | c | c | c |
| mg/kg = milligrams per kilogram a. Data is from RI/FS Sections 12.3, 12.4, and 14.9, and Appendices D and E. b. The EPA residential screening level for lead (400 mg/kg) was used to determine the need for cleanup; therefore, calculation of numeric health risk values for lead was not necessary. c. Human health risks cannot be calculated for unexploded ordnance in the same way that they are for chemical contamination. Instead, the need for cleanup is based on an assessment of physical danger. Unexploded ordnance poses a physical risk to human safety through the possibility of it exploding when handled or contacted, especially by machinery. Though unexploded ordnance encounters are relatively common, there has never been an accidental detonation at the INEEL caused by casual human contact (see RI/FS Section 4.1.2). | | | | |



The maximum acceptable level (also known as the Preliminary Remediation Goal) is established by EPA Region 9 as a generic risk-based concentration designed to be protective of human health.

excess cancer risk

The increased risk of developing cancer resulting from exposure to contaminants at a release site.

TNT/RDX Contamination Sites

The five TNT/RDX Contamination Sites contain concentrations of TNT, RDX, dinitrotoluene, and dinitrobenzene, which are chemical residues from explosives. TNT breaks down very slowly in soils and poses risk to humans through dermal contact, ingestion, or inhalation of fine particles. TNT is also a possible human carcinogen, and some of its degradation, or breakdown, products are probable human carcinogens. RDX may also cause adverse health effects that include cancer. Dinitrotoluene and dinitrobenzene also present an unacceptable risk, but only to ecological receptors. The TNT/RDX Contamination Sites may also pose a safety risk to humans from undetected unexploded ordnance, as discussed below.

For these sites, the risk estimates were developed by taking into account various assumptions about the frequency and duration of an individual's exposure to contaminated soil, groundwater, or produce grown in contaminated soil, as well as knowledge about the toxicity of TNT and RDX. The highest **excess cancer risk** to an individual posed by the contaminants in the soil and groundwater was determined to be 2 in 100. This means that if the contaminated soils are not remediated, as many as 2 out of every 100 individuals exposed to these contaminants could develop cancer as a result of the exposure.

Table 2. Ecological risk assessment results for WAG 6 and 10 sites that require remediation^a
(Shading indicates risks that exceed acceptable levels, as defined by the remedial investigation.)

| Ecological Risk | | | | | | |
|-------------------------|--------------------|------------------------------|-----------------------------------|--------------------|----------------|---|
| Sites | Contaminant | Hazard Quotient ^b | Contaminant Concentration (mg/kg) | | | Maximum Acceptable Level (mg/kg) ^d |
| | | | Minimum | Maximum | Average | |
| TNT/RDX Contamination | | | | | | |
| Field Station | TNT | ≤1 to ≤300 | 0.28 | 1,100 | 151 | 16 |
| | 1,3-Dinitrobenzene | ≤1 to ≤80 | 0.22 | 14 | 5 | 6.1 |
| Fire Station | TNT | ≤1 to ≤40 | 0.20 | 130 | 16.6 | 16 |
| | RDX | ≤1 to ≤40 | 0.23 | 3.7 | 1.2 | 4.4 |
| Land Mine Disposal Area | TNT | ≤1 to ≤10,000 | 0.26 | 79,000 | 8,610 | 16 |
| NOAA Grid | TNT | ≤1 to ≤500 | 0.20 | 1,900 ^c | 489 | 16 |
| | RDX | ≤1 to ≤20 | 0.22 | 1.78 ^c | 1.8 | 4.4 |
| | 1,3-Dinitrobenzene | ≤1 to ≤200 | 0.22 | 27 | 6.8 | 6.1 |
| NODA | RDX | ≤1 to ≤4,000 | 0.22 | 328 | 13.4 | 4.4 |
| Gun Range (STF-02) | Lead | ≤1 to ≤2,000 | 2.9 | 24,400 | 1,303 | 400 |
| Ordnance Areas | — ^e | — ^e | — ^e | — ^e | — ^e | — ^e |

mg/kg = milligrams per kilogram

a. Data is from RI/FS Sections 12.3, 12.4 and 14.9, and Appendices E and F.

b. Appendix F of the RI/FS describes how the hazard quotient ranges were calculated.

c. The figure given is the 95% upper confidence level (UCL). Calculation of the 95% UCL is explained in Section C-1.3 of the RI/FS.

d. The maximum acceptable level, also known as the preliminary remediation goal for human health, will be used to evaluate all contaminants and is considered protective of ecological receptors for these contaminants (see RI/FS Appendix K).

e. Unexploded ordnance poses no unacceptable risk to ecological receptors based on the lack of historical occurrences on site and the unlikelihood that an ecological receptor could strike an ordnance item with sufficient force to cause detonation (see RI/FS Section 12.2.1).

¹ The maximum acceptable level is established by EPA Region 9.

The level EPA defines as acceptable is 1 in 10,000. The highest **hazard index**, which measures potential adverse health effects other than cancer, was determined to be 690. Remediation is considered when the hazard index is greater than 1.

Human Health risks for the five TNT/RDX Contamination Sites could result from ingestion of soil, homegrown produce, and groundwater; and dermal contact with soil.¹⁴ It is the Agencies' judgment that the preferred alternative for the TNT/RDX Contamination Sites identified in this proposed plan is necessary to protect public health and welfare from actual or threatened releases of hazardous substances into the environment.

hazard index

A ratio between the contaminant intake concentrations and the concentrations that are not likely to cause adverse effects. The hazard index measures potential adverse health effects other than cancer (such as liver or kidney damage caused by exposure to contaminants), especially to sensitive populations such as children or pregnant women.



Ecological receptors used in the ecological risk assessment were selected from six general categories of animals and plants to represent the various ways that the receptors can be exposed to contaminants. Unfortunately, there are many species on the INEEL for which little scientific data of this sort is available. Therefore, more receptors were able to be studied for some groups than for others. Some of these receptors are:

- Birds: Mourning dove (herbivore), Blue-winged teal (aquatic herbivore), Sage sparrow (insectivore), Burrowing owl (carnivore), Black-billed magpie (omnivore)
- Mammals: Mule deer and Pygmy rabbit (herbivores), Townsend's western big-eared bat (insectivore), Deer mouse (omnivore), Coyote (carnivore)
- Reptiles and Amphibians: Sagebrush lizard (insectivore)
- Insects: No data available
- Fish: Not studied because there are no surface waters in the contaminated areas
- Plants: Various

Depending on scientific data available, effects of contaminants are studied for each of the threatened or endangered species, sensitive species, and species of concern that may be at the INEEL, including:

- 11 species of plants
- 20 birds
- 9 mammals
- 3 reptiles and amphibians
- 1 insect, and
- 1 fish.

A complete list of these species is in Table 17-11 of the RI/FS.

hazard quotient

A measure of potential adverse effects to plants or animals. Ecological risk assessment calculates the hazard quotient as contaminant exposure dose divided by toxicity reference value. Appendix F of the RI/FS explains this procedure.

Gun Range

The Gun Range, part of the INEEL's former Security Training Facility, has soil and railroad ties contaminated by lead dust and fragments from bullets. Lead is a metallic element that can cause severe damage to the nervous system, kidneys, and immune system, especially in children. Lead persists in soil for a long time and can accumulate in the food chain. For this site, the EPA residential screening level of 400 milligrams per kilogram was used to determine whether cleanup would be necessary. At the Gun Range, the maximum contaminant concentration detected in soil is 24,400 mg/kg. Because the EPA residential screening level for lead was used, excess cancer risk and hazard index calculations were not required. It is the Agencies' judgment that the preferred alternative for the Gun Range identified in this proposed plan is necessary to protect public health and welfare from actual or threatened releases of hazardous substances into the environment.

Ecological Risks

An ecological risk assessment was conducted for each contaminated site within WAGs 6 and 10. The ecological risk assessment identified the potential effects from contaminants of concern on ecological receptors (plants and animals). Risk was evaluated for plant and animal species that are common to WAGs 6 and 10, as well as any threatened or endangered species that may be present.

The results of the site-specific assessments were then forwarded for evaluation under the INEEL-wide ecological risk assessment, which was conducted as a separate part of this OU 10-04 investigation (see page 30).

The **hazard quotient** is a measure used to evaluate the significance of risks to ecological receptors. Due to the uncertainty inherent in the ecological risk assessment process, hazard quotients may be expressed as orders of magnitude reflective of the increasing levels of severity for unacceptable ecological risks. A range from 1 to 10, represents one order of magnitude. Therefore, sites with hazard quotients less than or equal to 10 were considered to pose limited risk to ecological receptors and were eliminated as a concern. Sites with hazard quotients greater than 10 are evaluated for possible remediation. If remediation is selected than a **preliminary remediation goal** is developed for each contaminant of concern. A discussion of the methodologies for ecological risk assessment is presented in Appendix F of the RI/FS.

At the TNT/RDX Contamination Sites, TNT, RDX, 1,3-dinitrobenzene, and 2,4-dinitrotoluene pose risk to ecological receptors. Effects of chronic exposure to ecological receptors from TNT can include impacts to blood (anemia), loss of liver function, testicular degeneration and decreased weight gain. An effect from chronic exposure to RDX and dinitrotoluene can include central nervous system toxicity, and exposure to dinitrobenzene may include reduction in reproductive function. Cleanup is required at these sites to reduce the risk from these contaminants. At the Gun Range (STF-02), risks to ecological receptors are posed by lead. Cleanup is necessary at this site because lead concentrations exceed 400 mg/kg. Chronic exposure to ecological receptors to lead at these levels can adversely affect their kidney, blood, bone and central nervous system. For the Ordnance Areas, the ecological risk assessment concluded that no unacceptable risks are posed to ecological receptors from accidental detonation. It is unlikely that an ecological receptor could strike an

ordnance item with sufficient force to explode it, and this assumption is supported by the lack of historical occurrences on site.

Native American Assessment of Risk

The INEEL lies within the area historically used by the Shoshone-Bannock Tribes of the Fort Hall Indian Reservation. A wide variety of natural and cultural resources and landscape features at the INEEL directly reflect tribal cultural heritage. These resources are of great importance to the Tribes in the maintenance of tribal spiritual and cultural values and activities, oral tradition and history, mental and economic well-being, and overall quality of life. The DOE is committed to protecting not only the health and safety of the Tribes but also the environmental and cultural resources that are essential to their subsistence and culture.¹⁵

To enhance understanding of Shoshone-Bannock concerns, particularly those directly associated with OU 10-04, the INEEL contracted directly with the Shoshone-Bannock Tribes to provide unique input for this remedial investigation.¹⁶ The Tribes' report is Appendix A to the RI/FS.

In the holistic worldview of the Shoshone-Bannock Tribes, concerns about land, air, water, plants, animals, and humans are paramount and all are interconnected. Changes and losses in the landscape are seen as leading to an imbalance in nature that affects all things. The tribes have specific concerns about contamination of land, water, and air at the INEEL. These include the maintenance of healthy populations of game and other wildlife; the continued presence of plants, animals, and features of the natural landscape important for traditional ritual observations; human health, particularly the health of tribal members using the INEEL under the Agreement-in-Principle, protection of prehistoric and traditional cultural sites and significant landscapes; future land uses; and sustainable long-term stewardship of the land and its resources.

The tribal analysis completed for WAGs 6 and 10 clearly indicates that all contamination at the INEEL poses a threat to the traditional subsistence and spiritual ecosystem. The OU 10-04 investigation, therefore, concluded that contaminated sites that pose unacceptable risk to human health or ecological receptors are also unacceptable from the standpoint of Shoshone-Bannock tribal concerns. The investigation further recognized that some sites would be of concern for Shoshone-Bannock interests even though the baseline risk assessment concluded that they do not require cleanup.

The tribal report emphasizes that actions can be taken to correct changes, disturbances, and voids in the native landscape ecology, and thereby restore traditional and sustainable harmony. The cultural concerns identified in the Shoshone-Bannock evaluation were factored into the remedial investigation risk assessment and feasibility study. It is understood that remedial actions to protect human health and the environment, in conjunction with ongoing communication and consultation with the Tribes under the Agreement-in-Principle, will address some Native American concerns regarding land contamination at the INEEL. These remedial actions will be selected by the Agencies' under the OU 10-04 Record of Decision.

preliminary remediation goal

A level of contamination that is considered safe for human health and the environment. The preliminary remediation goals are established during the feasibility study based on scientific information, and are used as a target. Alternatives are developed and evaluated based on how well they meet the preliminary remediation goals. Final remediation goals are set in the Record of Decision.

REMEDIAL ACTION OBJECTIVES

The remedial action objectives describe what the proposed site cleanup is expected to accomplish. The remedial action objectives always confirm that either the contaminants will be removed, or actions will be taken to protect human health and the environment from any risks posed by any contaminants that remain. The remedial action objectives for the WAG 6 and 10 sites are to:

- Inhibit dermal exposure to and ingestion of contaminated soils and food crops that would result in a total excess cancer risk greater than 1 in 10,000 (1×10^{-4})
- Inhibit dermal exposure to and ingestion of soils and food crops contaminated with noncarcinogenic contaminants of concern that would result in a hazard quotient greater than 1
- Inhibit human and ecological receptor exposure to soils contaminated with lead at concentrations greater than 400 mg/kg
- Inhibit ingestion of groundwater with contaminant concentrations exceeding maximum contaminant levels or risk-based concentrations that are attributable to past releases in OU 10-04

CERCLA Evaluation Criteria

Threshold Criteria

✓ **Overall protection of human health and the environment**

Does the alternative protect human health and the environment in both the short and the long term by eliminating, reducing, or controlling the risk?

✓ **Compliance with applicable or relevant and appropriate requirements (ARARs)**

Does the alternative comply with environmental laws?

Balancing Criteria

✓ **Long-term effectiveness and permanence**

What risks do the untreated waste or post-treatment residuals pose? How adequate or reliable are the controls, such as institutional controls, used to manage treatment residuals and untreated wastes?

✓ **Reduction of toxicity, mobility, or volume through treatment**

How much of the contamination will be eliminated? Is the treatment permanent? How much and what types of residuals will be remaining after treatment?

✓ **Short-term effectiveness**

Does the alternative pose any risks to the community, workers, or the environment during implementation? How soon will remedial action objectives be achieved?

✓ **Implementability**

Is the proposed technology feasible and reliable? Can its effectiveness be monitored? Are the necessary materials, equipment, specialists, and services available?

✓ **Cost**

What are the estimates for capital costs and for operating and maintenance costs? Are the costs proportional to the overall effectiveness of the alternative?

Modifying Criteria

✓ **State acceptance**

Does the state concur with the preferred alternative?

✓ **Community acceptance**

Which aspects of the alternatives does the public support or oppose?

- Inhibit inadvertent human contact with unexploded ordnance
- Inhibit ecological receptor exposures to soil contaminated with contaminants of concern that would result in a hazard quotient greater than or equal to 10. This remedial action objective excludes naturally occurring elements and compounds that are not attributable to past releases in OU 10-04.

CERCLA Process

For most sites, several cleanup alternatives are available to meet the remedial action objectives. The preferred alternative is identified through an evaluation process that uses nine criteria defined by CERCLA. For each site, the best alternative overall will be selected as the final remedy.

The nine CERCLA criteria fall into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The threshold criteria must be met for an alternative to be eligible for selection. The balancing criteria are used to weigh major trade-offs among the alternatives. The modifying criteria are used to factor in state and community concerns. They can only be fully considered after public comment is received on the proposed plan. During evaluation, each alternative is first assessed individually against the criteria. Then the alternatives are ranked in terms of how well each one satisfies the balancing criteria, from highest to lowest effectiveness. Finally, a comparative analysis assesses the overall performance of each alternative relative to the others.

Costs for each alternative are calculated in terms of *net present value*.¹⁷ Capital costs are those required to construct facilities necessary to complete the remedial action. They include the costs of design and construction. Operating and maintenance costs cover the labor and maintenance required to operate the treatment systems for the anticipated duration of the remedial action.

CERCLA (the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund Act)

The federal law that establishes a program to identify, evaluate, and remediate sites where hazardous substances may have been released (leaked, spilled, or dumped) to the environment.

net present value

The amount of money that would need to be invested this year to cover all of a project's costs for the life of the project. Calculations of present value account both for projected returns on investments and anticipated rates of inflation.

DESCRIPTION AND EVALUATION OF ALTERNATIVES

Remedial alternatives for the OU 10-04 contamination sites are presented below. For each site, this proposed plan describes the history and physical characteristics, the nature of contamination, the remediation alternatives, and the Agencies' preferred alternative. All the preferred alternatives are expected to attain the remedial action objectives included on page 12. The alternatives are numbered to correspond with the numbers in the RI/FS. For the reader's convenience, a summary of the sites and the preferred alternative for each is included on page 38. The comprehensive RI/FS provides complete details about the investigation of each site.

The WAG 6 and 10 sites that required cleanup were grouped according to common characteristics or contaminant sources. The Ordnance Areas consist of three World War-II bombing and gun ranges that may require cleanup of



The term "laws" is being used in this proposed plan to designate applicable or relevant and appropriate requirements (ARARs), the second CERCLA evaluation criterion. ARARs are the body of Federal and State laws, regulations, and standards governing environmental protection and facility siting with which the selected cleanup alternative must comply.



The principal laws (ARARs) that the selected cleanup alternative must comply with are:

- Idaho Groundwater Quality Standards
- Military Munitions Rule
- Clean Air Act
- Idaho Hazardous Waste Management Act
- National Historic Preservation Act.

A detailed list of specific laws that apply to remediation of the site is in Section 22 of the 10-04 RI/FS.

institutional controls

Generally includes all non-engineered restrictions on activities, access or exposure to land, groundwater, surface water, waste and waste disposal areas, and other areas or media. Some common examples of tools to implement institutional controls include restrictions on use or access, zoning, governmental permitting, public advisories, or installation master plans. Institutional control commitments are necessary where hazardous substances will remain on site at levels which prevent unrestricted and unlimited use of the site.



Each WAG that has completed a ROD has also completed an institutional control plan. Within these plans many site specific institutional controls are common to many of the WAGs. Commonalities include: visible access restrictions, access controls, activity controls (procedural and work control measures), property lease and transfer requirements, and inclusion in the INEEL comprehensive facilities and land use plan (site location boundaries). Operable unit-specific institutional controls will transition to site-wide institutional controls. A comprehensive site-wide institutional control approach will be developed during the OU 10-08 RI/FS Workplan scheduled for April 2002.

unexploded ordnance. The TNT/RDX group consists of five sites contaminated with TNT, RDX, 1,3-dinitrobenzene, and 2,4-dinitrotoluene. The Gun Range (STF-02) is evaluated separately since it is the only site contaminated with lead.

Common Elements

All the alternatives will comply with applicable laws, and the Agreement-in-Principle, which require tribal involvement during the identification and protection of cultural resources that might be affected by INEEL activities.

Remedial actions that are taken to protect human health will also protect ecological receptors.

All alternatives except for the "No Action" alternative and those developed for the Gun Range call for ***institutional controls*** following cleanup activities. Institutional controls are typically developed in combination with remedial action alternatives to help reduce exposure from residual contamination remaining after cleanup. Institutional controls at WAG 10 may include long-term monitoring, visible access restrictions (such as signs), and control of land use, as determined to be appropriate. Institutional controls specific for OU 10-04 sites will be developed within an institutional control plan following the ROD. These institutional controls will also address the remedial action objectives incorporated into the ROD. The institutional control period, under DOE control, is assumed to extend for a 100-year period or until a transfer from DOE occurs; unless controls are discontinued based on the results of a 5-year review. However, institutional controls will be necessary as long as an unacceptable risk remains or until cleanup levels have been achieved.¹⁸

The development of institutional controls also takes into account the current and future land uses of WAGs 6 and 10. All of the WAG 6 sites and a majority of WAG 10 sites fall within the industrialized areas of the INEEL. The remaining areas of WAG 10, which are largely undeveloped, are used for environmental research, ecological preservation, sociocultural preservation, grazing, and some forms of recreation.¹⁹ The INEEL is likely to continue as an industrial and research facility, and these WAGs will maintain their current land uses.